The new Uppsala Neutron Beam Facility

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A new quasi-monoenergetic neutron-beam facility has been constructed at the The Svedberg Laboratory (TSL) in Uppsala, Sweden. Key features include an energy range of 20 to 175 MeV, high fluxes and the possibility of large-area fields. Besides cross-section measurements, the new facility has been designed specifically to provide optimal conditions for testing of single-event effects in electronics and for dosimetry development.

Neutrons are produced by the ^{7}Li(p,n)^{7}Be reaction, using a proton beam from the Gustaf Werner cyclotron. The distance from the neutron production target to the point where the beam enters the experimental area is 3 meters. For a proton beam energy of 98 MeV, a beam current of 5 mA and a Li target thickness of 8 mm, this will give a neutron fluence of about 5 x 10^5 neutrons/(cm^2 s). This is an increase by a factor of 7 when compared to the previous neutron-beam facility. A variable collimator system allows beam profiles of up to 30 cm in diameter at the beginning of the experimental hall corresponding to a flux of 3.5 x 10^8 neutrons/s for the conditions mentioned above. Neutron fields of diameters up to about 1.5 meters can be obtained by sacrificing intensity. The proton beam current is about a factor of 12 lower at energies above 100 MeV when the cyclotron operates in FM mode. This leads to a lower neutron fluence, which, however, can be partly compensated by the use of neutron production targets with a thickness of up to 26 mm. Thus, even at the highest energy, neutron fluences of about 10^5 neutrons/(cm^2 s) can be achieved. An additional irradiation position is provided at the distance of about 1.9 m from the lithium target. The position allows one to increase the neutron flux further by a factor of 2.5, at the expense of limited accessibility and size of irradiated objects. This position can be used parasitically with other experiments. Commissioning runs have been scheduled for early 2004 with the goal to measure the neutron energy spectrum, the shape of the neutron beam and in order to evaluate the background environment. First experiments have been scheduled for late spring 2004.

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